COMPARATIVE TRANSMISSION SPECTROGRAMS OF DIFFERENT CONCENTRATIONS OF LEAF EXTRACT

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(WITH THREE FIGURES)

This study continues the work upon the physical properties of leaf extracts and is a preliminary effort to show the effects of increased dilution of an alcoholic solution of leaf green. FERGUSON, DE LOACH, and WEBB (*loc. cit.*, p. 560, fig. 2) have indicated that dilution of the ethyl alcohol stock solution produces changes in the transmission spectrogram giving an increase in both transmission and absorption regions.

The stock solution used in this study was prepared in the following manner: methyl alcohol (100 ml.) was added to selected fresh green leaves of *Poa pratensis* (3 gm.) and the resulting mixture was heated for 20 min. on a water bath under a reflux condenser. The rather dark green alcohol solution was then decanted. This stock solution considered as 100 per cent. (curve no. 1, fig. 1) was then diluted with methyl alcohol giving these percentages: 50 per cent. (curve no. 2), 25 per cent. (curve no. 3), 10 per cent. (curve no. 4), and 1 per cent. (curve no. 5). The Coleman Regional Spectrophotometer was used to obtain all graphs in the study. The points recorded in each curve represent the average transmission of bands 30 mμ in width.

It may be noted that the form of the curve of transmission of an ethyl alcohol solution of leaf extract is essentially the same as that given by the stock solution (curve no. 1) of this study. There is a tendency to adhere to this characteristic form as shown by the five curves of figure 1. There is relatively little transmission in the region of 350 mμ to 450 mμ in solutions of 100 per cent., 50 per cent., and 25 per cent. Transmission in this area increases sharply in the 10 per cent. solution which displays a marked inclination at *ca.* 430 mμ. Curve no. 5 shows a relatively higher percentage of transmission for the region of *ca.* 350 mμ to 450 mμ than do the other curves. As is expected, the transmission peak at *ca.* 520 mμ increases as the solution is diluted. Curve no. 5 yielded by the 1 per cent. dilution, which was so weak as to be visually indistinguishable from methyl alcohol, still maintains some semblance of this peak. As dilution increases the characteristic "absorption band" as shown by the sharp inclination at *ca.* 660 mμ becomes less accentuated. Curve no. 5 retains but small evidence of this major feature. All curves agree in their sharp inclination at *ca.* 660 mμ and in the leveling off in the infra-red.

The minimum transmission of 0.4 per cent. appears at *ca.* 360 mμ (curve no. 1) while the maximum transmission of 99.6 per cent. appears at *ca.* 740 mμ (curve no. 4). The spectral range extends from 360 mμ to 950 mμ.

In analyzing the comparative graphs shown in figure 1, the peak, at *ca.* 530 mμ, was explained. It was found that the rate at which the transmis-

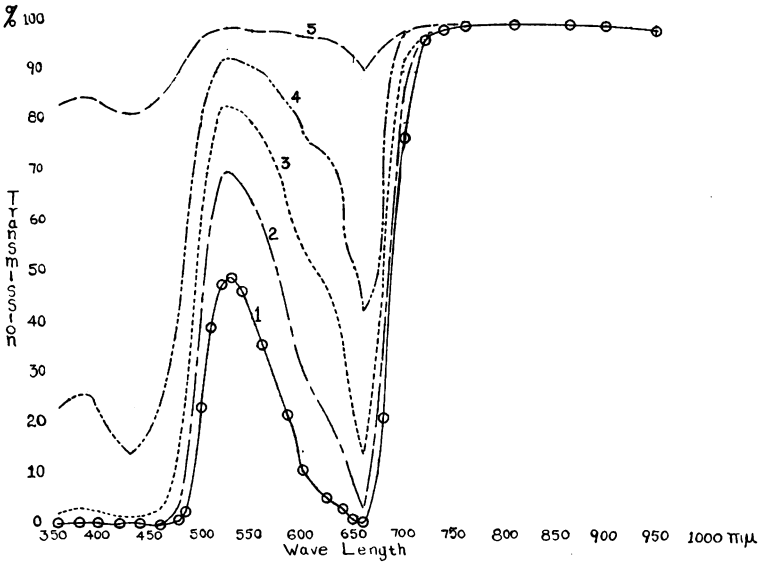

FIG. 1. Comparative graphs showing effects of dilution upon the transmission spectrograms of alcoholic leaf extracts.

sion increases in respect to the decrease in concentration of the solution follows a well defined exponential equation.

Equation no. 1

$$T = 99.65\ e^{-.007\ D}$$

where: T = percentage of transmission
D = percentage of concentration
e = Naperion base

The following figure represents this graphically:

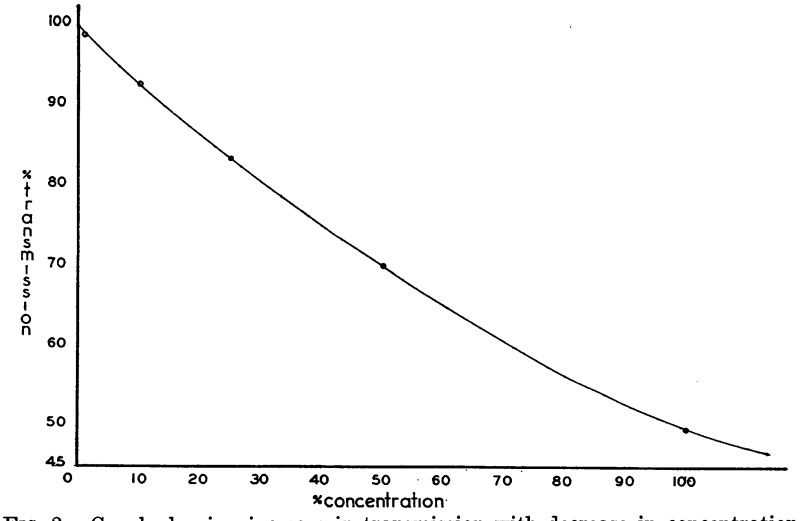

FIG. 2. Graph showing increase in transmission with decrease in concentration of a solution of alcoholic leaf extract for *ca.* 530-mμ wave band.

The trough of the graphs of figure 1, at *ca.* 660 mμ, was also studied. It was ascertained that the rate at which transmission increases in respect to the decrease in concentration follows a hyperbolic equation.

Equation no. 2

$$(d + 8.6)(T + 7.3) = C = 926$$

where: T = percentage of transmission
D = percentage of concentration
C = constant

The following figure shows this relation graphically:

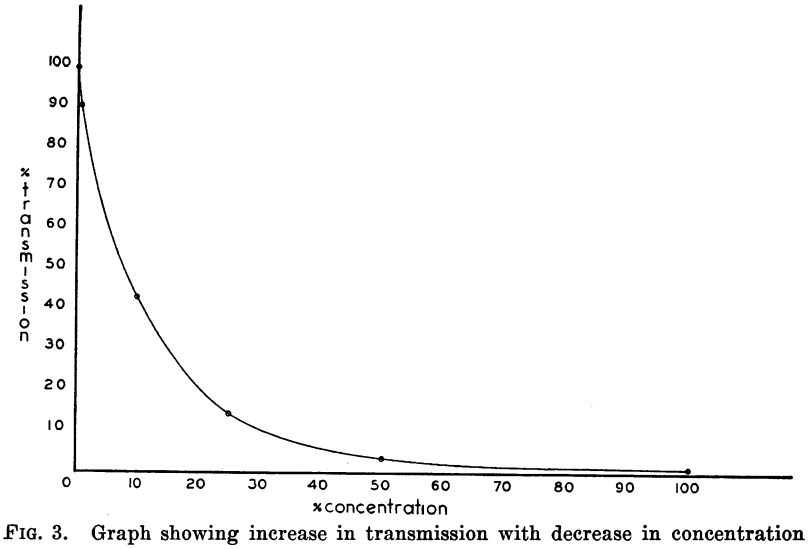

FIG. 3. Graph showing increase in transmission with decrease in concentration of a solution of alcoholic leaf extract for *ca.* 660-mμ wave band.

Further comparative studies on the effect of dilution upon leaf extracts are considered by the authors.

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LITERATURE CITED

1. FERGUSON, F. F., DELOACH, W. S., and WEBB, L. W., JR. Transmission spectrogram of leaf extracts. Plant Physiol. **15**: 559–560. 1940.